

National Aeronautics and Space Administration



SCIENCE

Science Committee Report

Dr. Wes Huntress, Chair

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Science Committee Members

Wes Huntress, Chair

Byron Tapley, (Vice Chair) University of Texas-Austin, Chair of Earth Science

*Alan Boss, Carnegie Institution, Chair of Astrophysics

Ron Greeley, Arizona State University, Chair of Planetary Science

Gene Levy, Rice University, Chair of Planetary Protection

Roy Torbert, University of New Hampshire, Chair of Heliophysics

Jack Burns, University of Colorado

Noel Hinners, Independent Consultant

Judith Lean, Naval Research Laboratory

Michael Turner, University of Chicago

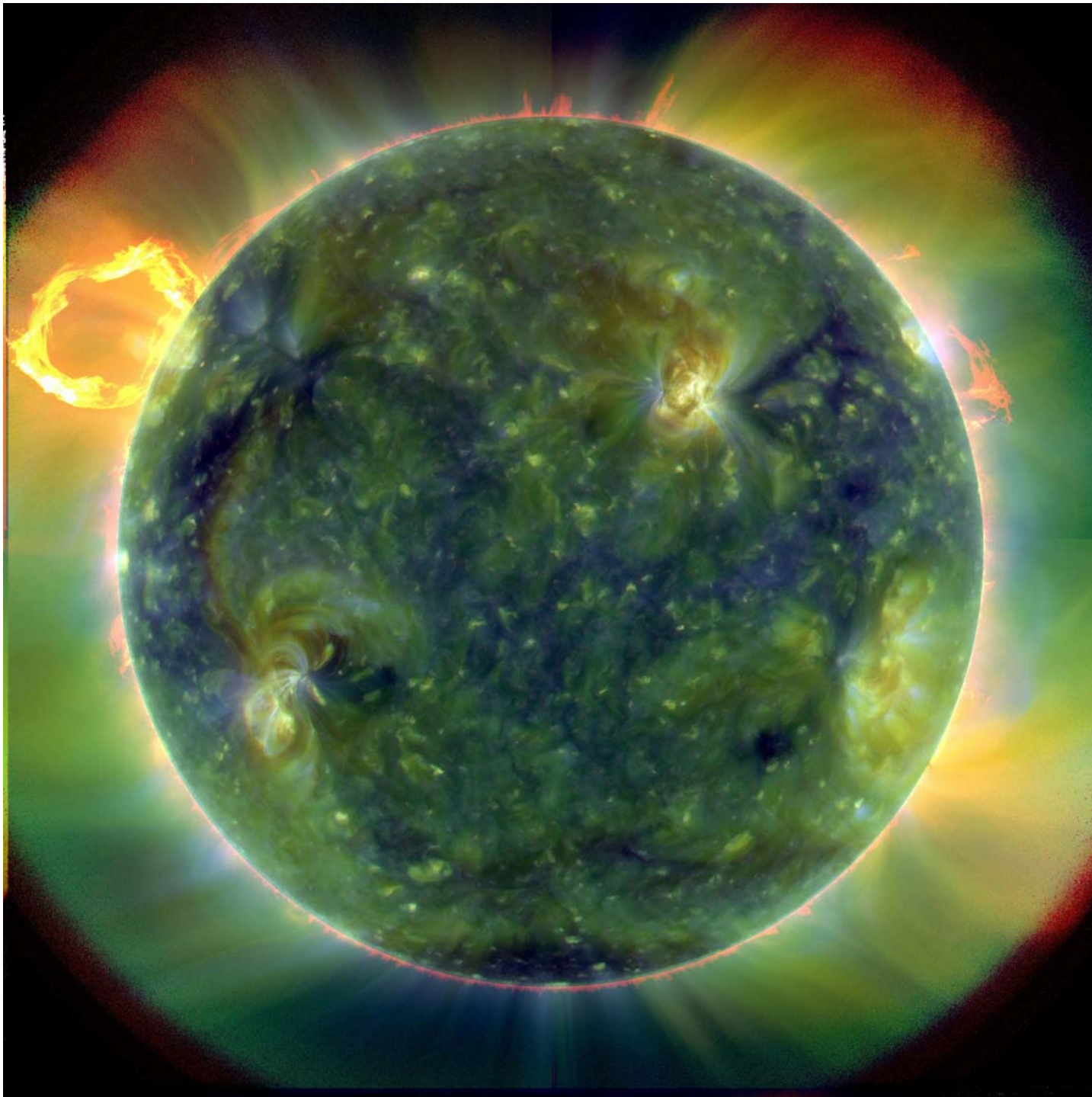
Charlie Kennel, Chair of Space Studies Board (*ex officio* member)

* = Newly Appointed



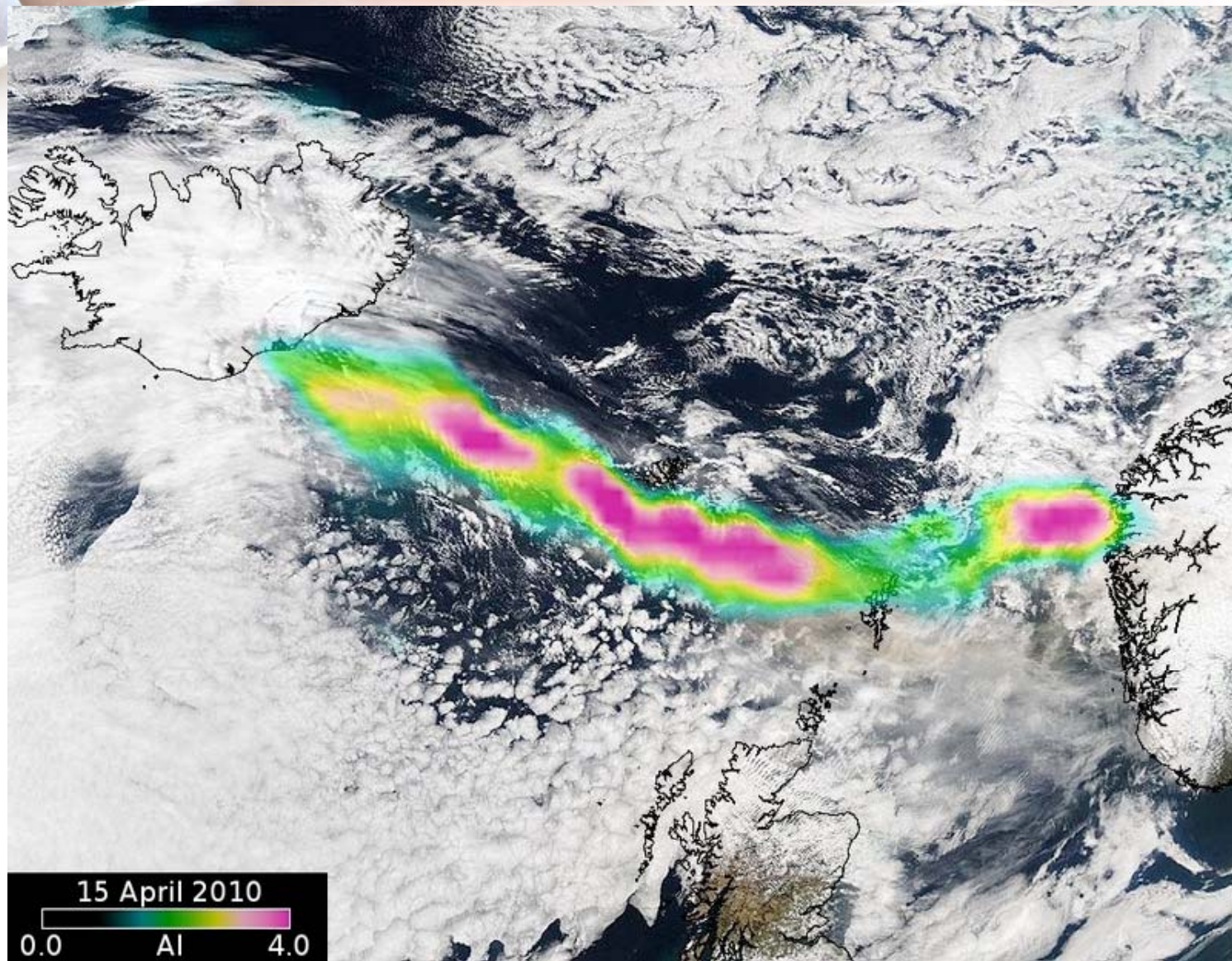
Agenda

- **Science Results**
- Programmatic Status
- Findings



- Early composite image from SDO.
- Disk:
Red: 211 Å Fe XIV
Green: 193 Å Fe XII
Blue: 171 Å Fe IX
- Limb:
Prominence: 304 Å He II
Corona: Inverse radially graded filter applied above the limb to demonstrate excellent S/N for corona above disk

OMI-MODIS Images of Eyjafjallajokull Ash Cloud

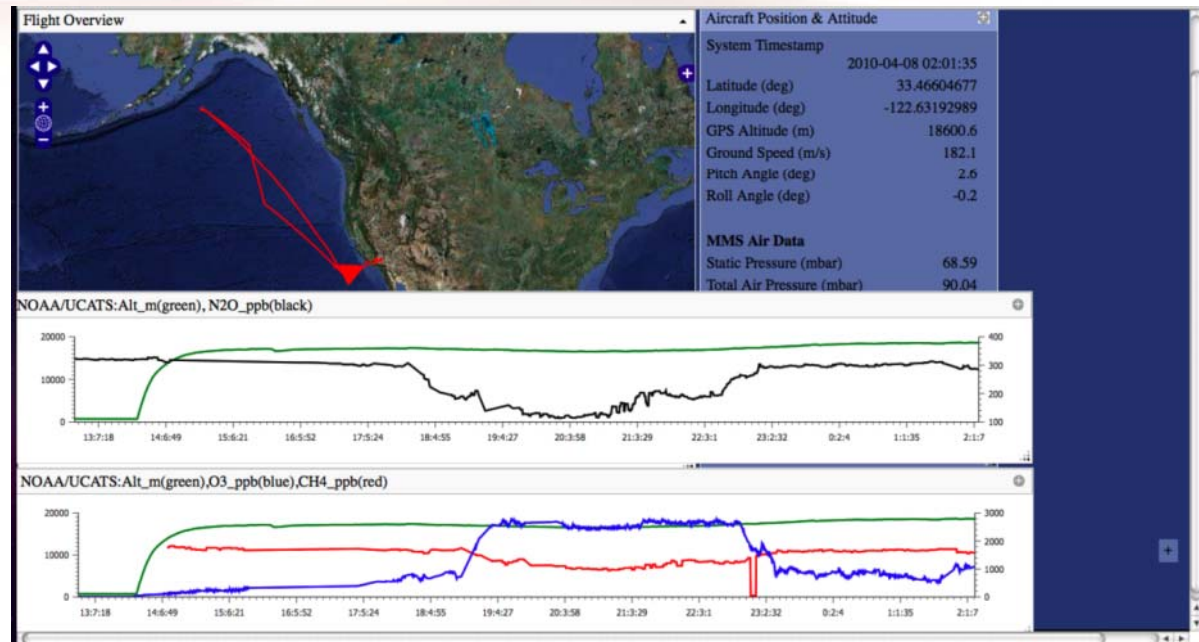


Unpiloted Global Hawk Completes First Science Flight Over Pacific – Wednesday, April 7

NASA and the National Oceanic and Atmospheric Administration (NOAA) have successfully completed the first science test flight of the Global Hawk unpiloted aircraft system over the Pacific Ocean. The flight was the first of five scheduled for this month's Global Hawk Pacific (GloPac) mission to study atmospheric science over the Pacific and Arctic oceans. The mission includes more than 130 researchers and technicians.

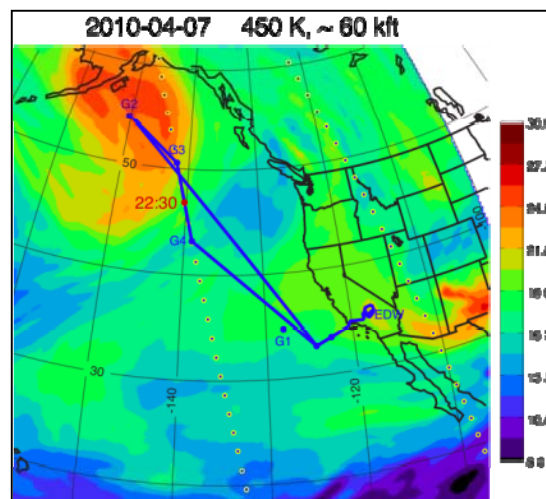


The Global Hawk can fly autonomously to altitudes above 60,000 feet -- roughly twice as high as a commercial airliner -- and as far as 11,000 nautical miles, for as long as 30 hours.

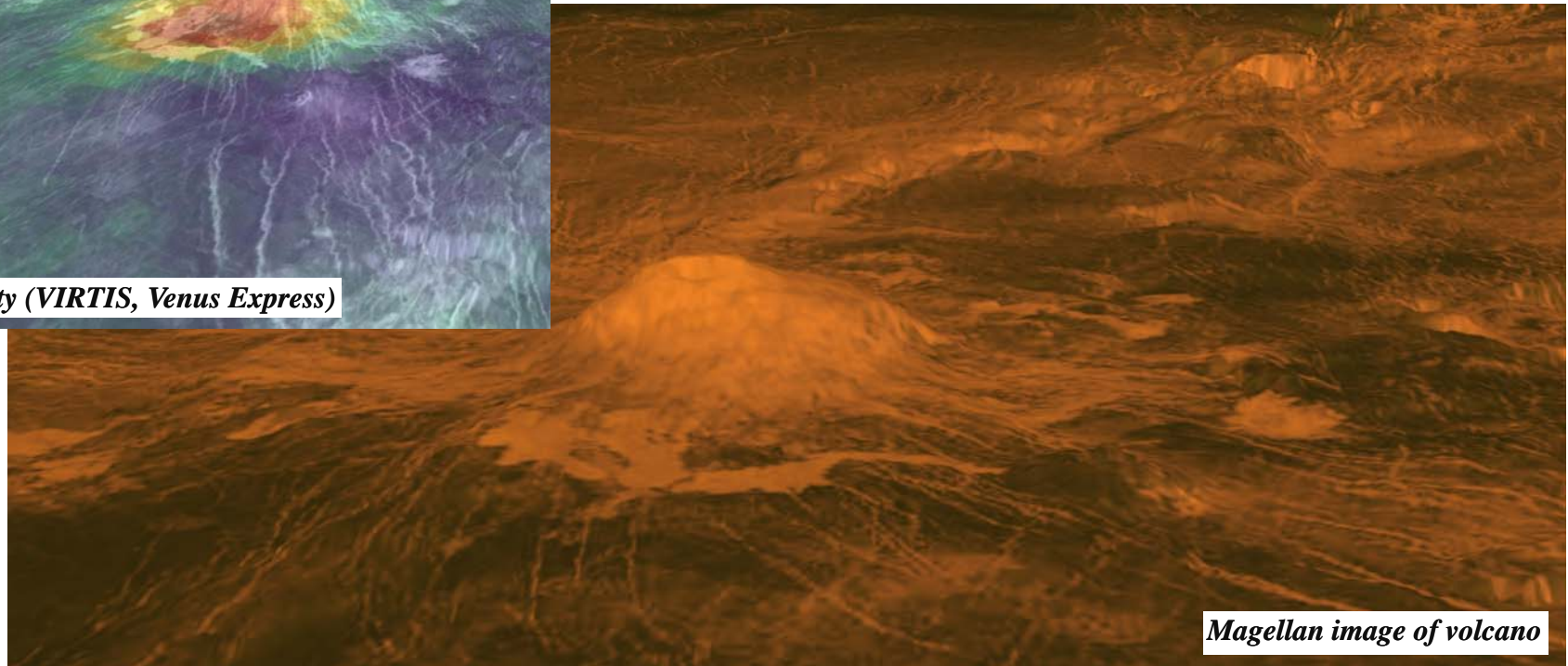
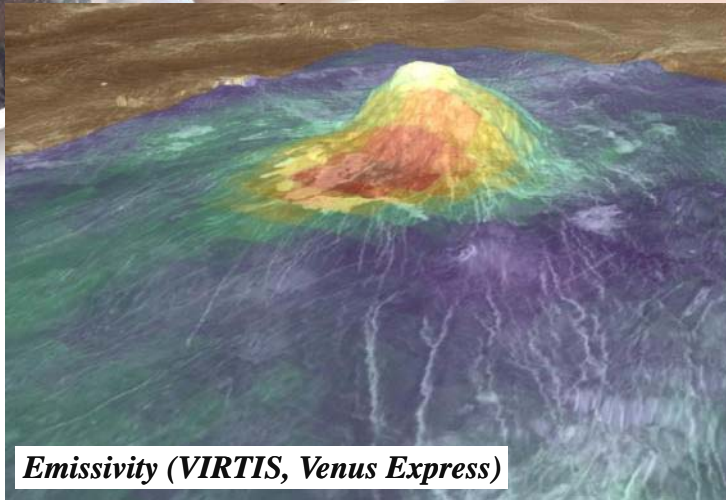


Above: The Global Hawk Operations Center (GHOC) screen capture shows ozone tripling (blue line) as the GH flew into the polar fragment. The red and black lines show CH₄ and N₂O falling. The green trace shows the aircraft altitude. The sharp increase of ozone proves that the flight intercepted the polar air fragment! (X axis is time).

Left: The blue line indicates the GH flight track. The colors represent air masses with polar (yellow-orange-red), mid-lat (green-blue), and tropical characteristics (purple-black). The small dots show the satellite sub-orbital track for Calipso. The polar fragment is the orange oval region in southern Alaska and the Gulf of Alaska.



Geologically Recent Volcanism on Venus (?)



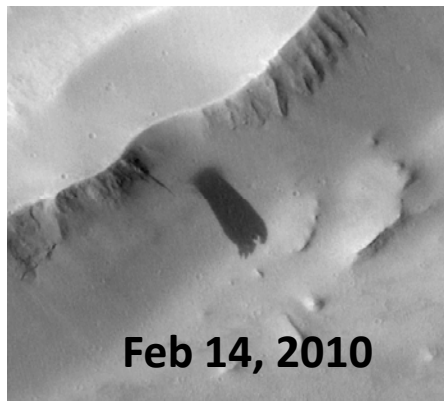
- High emissivity is function of ferric (Fe, Mg) minerals (“fresh” basalt)
- Ferric minerals weather rapidly in Venus environment
- High emissivity correlates with youngest lavas here (Magellan mapping)
- Thus, this volcano could reflect lava flows < 2.5 My in age
- ***But ! Other interpretations possible; idea needs to be tested***

(Smrekar et al., Science 2010)

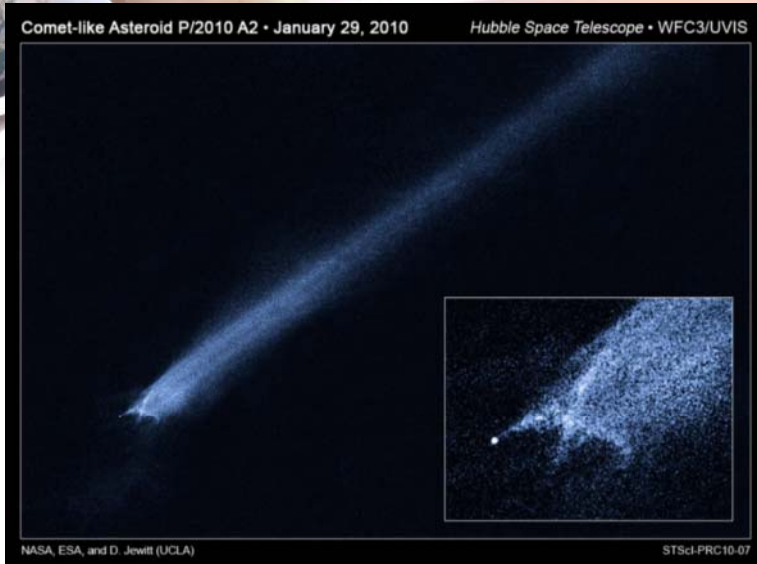
Impact-Triggered Dust Avalanche on Mars

MRO's Context camera (CTX) captured the results of a giant landslide on Olympus Mons. Slope streaks (dust avalanches) are common on Mars but this one is unusually wide and it began from an unusual fuzzy extended source area. HiRISE acquired the follow-up image (right) revealing a small, pristine impact crater (blue arrow) in the source area, which resembles the airblast patterns seen at many other new impact sites.

Scientists conclude that an impact event occurred and triggered a large dust avalanche.



Asteroid Processes and Diversity



Active Impact?

Evidence for asteroid collisions abound in the main belt – e.g. families, dust bands. This is the first time the event may have been captured shortly after it occurred.

Diversity

2008 TC3 was the first asteroid discovered before it impacted Earth. Determined to be a spectral F-type, the asteroid created a debris field in the Nubian desert in Sudan.

The strewn field is mostly Ureilites, but includes Eucrites, Ordinary Chondrites, and Carbonaceous Chondrites!

This raises fundamental questions about some asteroids as inhomogeneous accumulates and the interpretation of asteroid spectra.



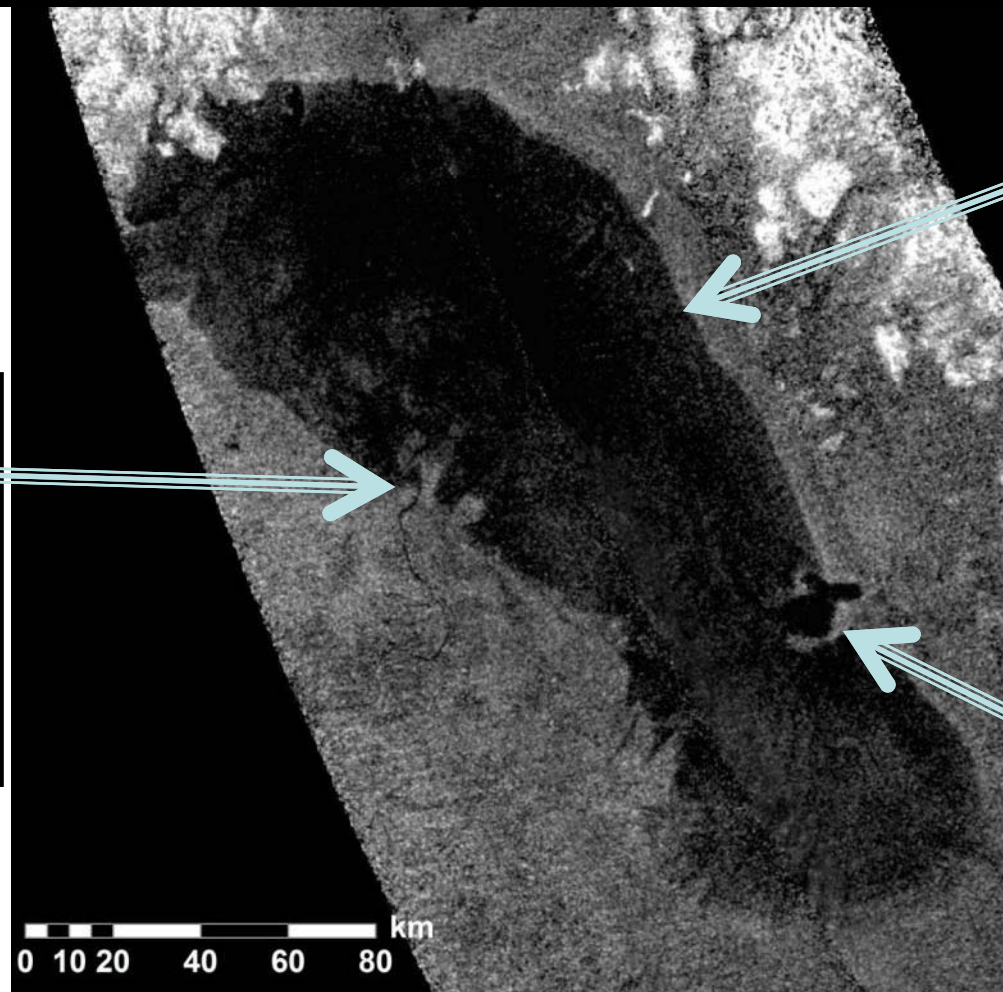
Giant Footprint on Titan

Beaches, Deltas and Flooded Canyons around Titan Lake Ontario Lacus
Radar SAR Image from Cassini's T65 Fly-by, January 2010

Titan Radar Mapper's Synthetic Aperture Radar (SAR) image of Ontario Lacus, near Titan's south pole, taken by NASA's Cassini spacecraft in January 2010. Even though this lake is filled with methane and ethane, and Titan's surface temperature is -290°F , the shoreline resembles that of some terrestrial lakes

River delta

This false color image of Lake Albert (Uganda) shows a delta very similar to the one we see on the SW shore



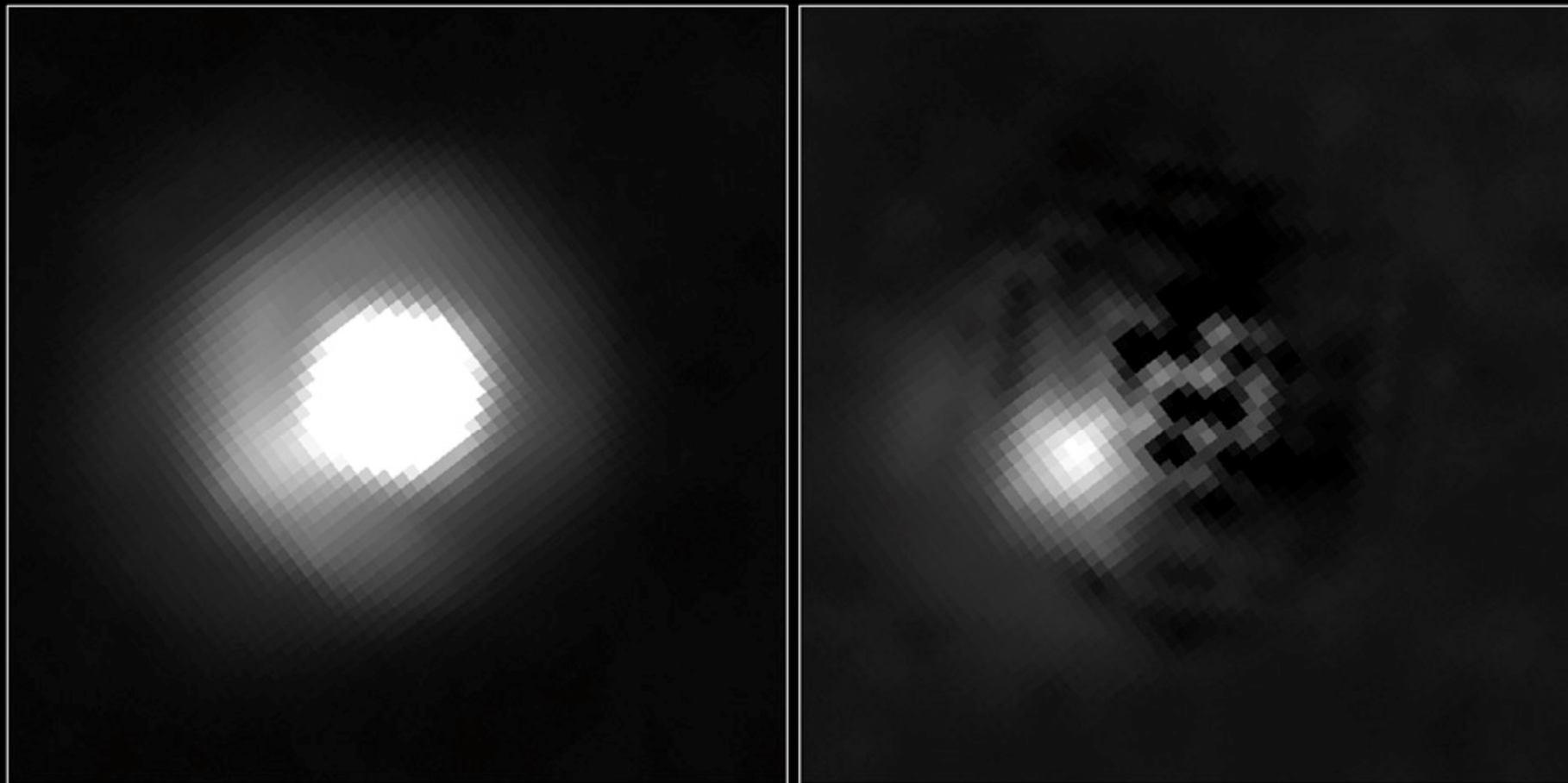
Cuspate Beach

The western shore of Lake Michigan (US) has a similar smooth beachfront as Ontario Lacus, suggesting that onshore winds shaped this beach on Titan

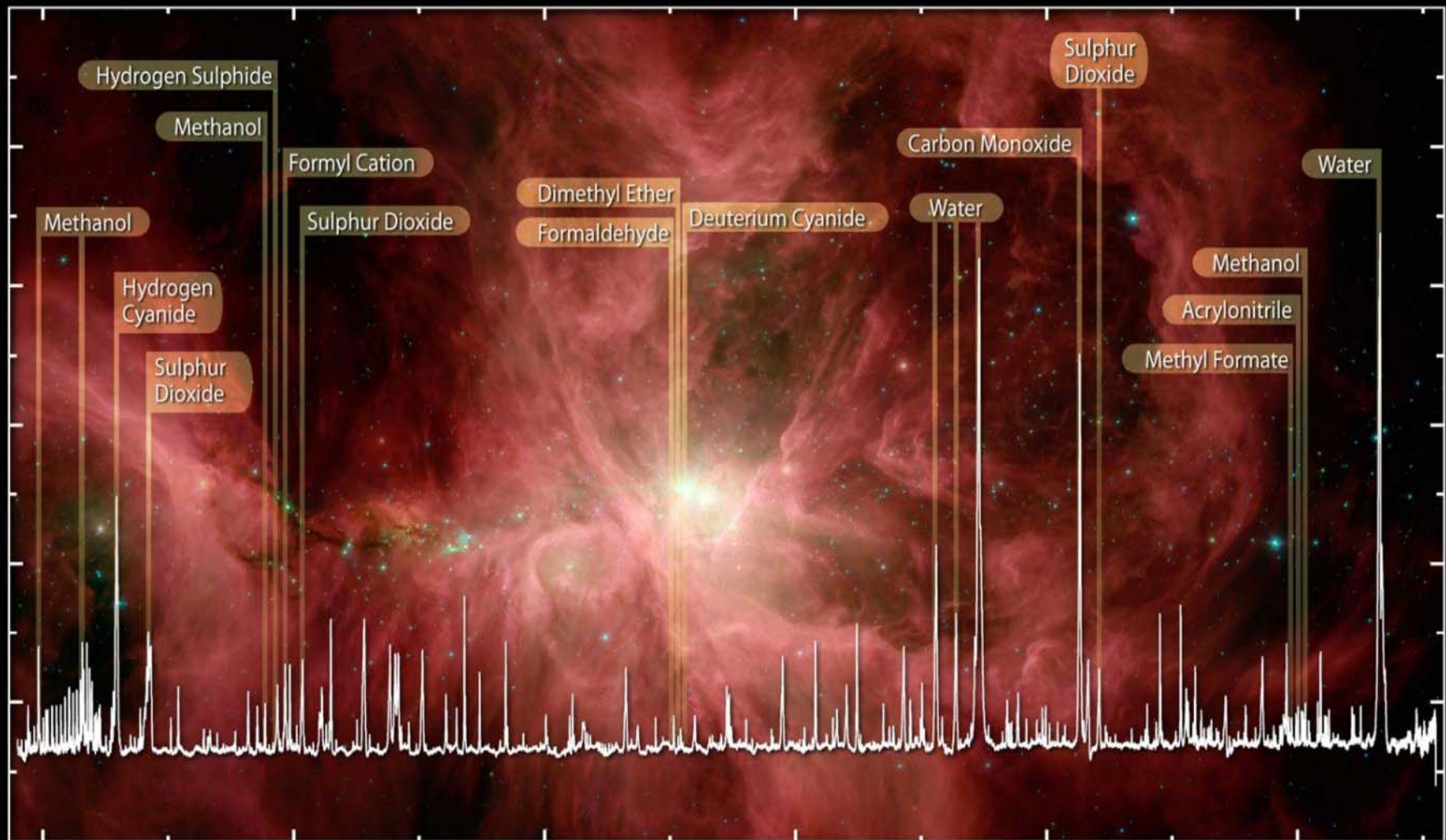


Bay with intrusions

Lake Powell (US) is a flooded canyon. Many similar-looking features exist on Titan



Brown Dwarf Star 2MASS J044144 and Planetary-Mass Companion
Hubble Space Telescope • WFPC2



HIFI Spectrum of Water and
Organics in the Orion Nebula

© ESA, HEXOS and the HIFI consortium
E. Bergin

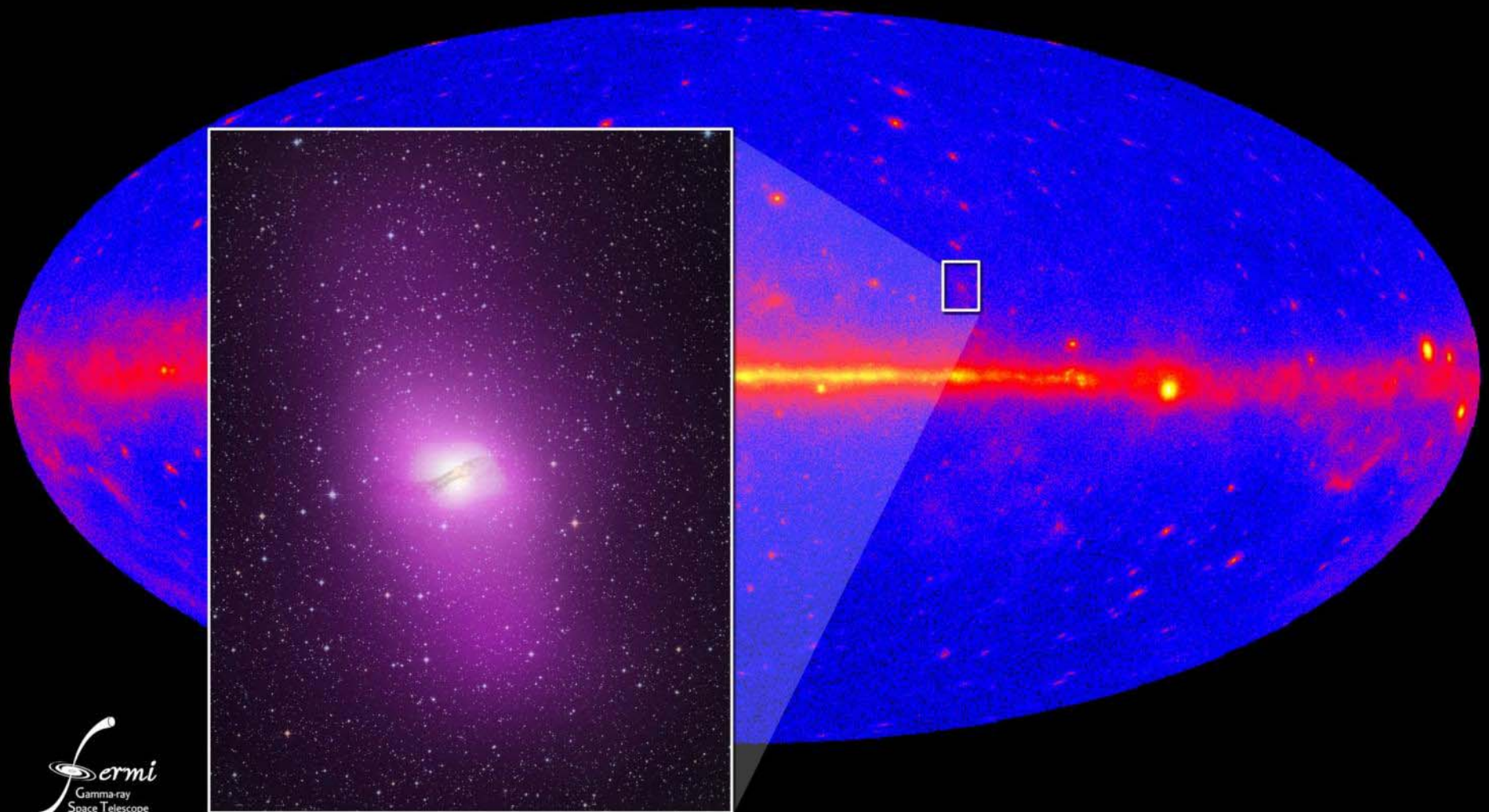


Berkeley 59 cluster



Image Credit: NASA/JPL-Caltech/WISE Team

NASA's Fermi telescope resolves radio galaxy Centaurus A





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Highlights from the NAC SciCom Meeting

1. The James Webb Space Telescope has passed its CDR
2. The Solar Dynamics Observatory is now in operation
3. The NAC SciCom has provided its input to the 2010 SMD Science Plan
4. The NAC SciCom had a session with Bobby Braun (CTO) on his plans to revive the agency's technology development programs
5. The NAC SciCom had a session with Mark Uhran (SOMD) on potential utilization of the ISS for Earth & space science



Overall Mission Classes

“Foundational”

- Glory (1/2010)
- Aquarius (5/2010)
- NPP (1-6/2010)
- LDCM (12/2012) (**w**/TIRS)
- GPM (7/2013, 11/2015)

Funded

“Decadal Survey” (NRC)

- Venture-Class (2009, 2011, ...)
- SMAP (3/2014)
- ICESAT-II (2015)
- CLARREO
- DESDynI (SAR, LIDAR)
- Tier-2 (5 missions)
- Tier-3 (6 missions)

Partially Funded

“National Needs” (Congress)

- Carbon Recovery (vice-OCO)
- ~~TIRS~~ (LDCM or free-flyer)
- DSCOVR
- SAGE-III
- GIFTS

Unfunded

“Climate / Operational” (Other Agencies)

- Vector Winds (vice QuikSCAT)
- Space Weather (vice ACE)
- Ocean color, Aerosols (vice MODIS)
- Nadir Altimetry (vice OSTM/Jason-2)
- GPSRO
- Broad-band Radiation Bud.(CERES)
- “R 2 O” infusion ...

Unfunded



Current Mission Class Status

“Foundational”

- Glory (1/2010)
- Aquarius (5/2010)
- NPP (1-6/2010)
- LDCM (12/2012) (w/ TIRS)
- GPM (7/2013, 11/2015)

Funded

“Decadal Survey” (NRC)

- Venture-Class (2009, 2011, ...)
- SMAP (3/2014)
- ICESAT-II (2015)
- CLARREO
- DESDynI (SAR, LIDAR)
- Tier-2 (5 missions)
- Tier-3 (6 missions)

Major Improvement

“National Needs” (Congress)

- Carbon Recovery (vice-OCO)
- TIRS (LDCM or free-flyer)
- DSCOVR
- SAGE-III
- GIFTS

Funded

“Climate / Operational” (Other Agencies)

- Vector Winds (vice QuikSCAT)
- Space Weather (vice ACE)
- Ocean color, Aerosols (vice MODIS)
- Nadir Altimetry (vice OSTM/Jason-2)
- GPSRO
- Broad-band Radiation Bud.(CERES)
- “R 2 O” infusion ...

Partially Resolved



Select International Collaboration

- European Space Agency
 - Joint Mars Architecture Team formed for joint activities
 - Earth Science Framework (Field Campaigns/Cal-Val; Ground systems, data products, mission “interoperability”; Flight missions) ready for signature
 - Solar Orbiter Mission (ESA) collaboration with Heliophysics Division now in pre-phase A study; Candidate payload competitively selected
 - Proposed cooperation on Euclid (dark energy) & Plato (survey of exoplanet systems) under review by SMD
- JAXA (Japan)
 - ALOS-TDRSS (F-10) operational data transmission
 - GOSAT/ACOS/OCO-2
 - Global Precipitation Measurement (GPM)
- DLR/GFZ (Germany)
 - German funding for Gravity Recovery and Climate Experiment (GRACE) through end-of-mission
 - Preliminary discussions on GRACE Follow-On mission



Select International Collaboration (Cont'd)

- CONAE (Argentina)
 - Aquarius/SAC-D
 - NASA provides Aquarius instrument, launch
 - CONAE provides spacecraft, 7 instruments (some international contributions)
- CNES (France)
 - SWOT (wide-swath altimetry for hydrology and oceans)
- INPE (Brazil)
 - Sustained discussions of Global Precipitation Measurement (GPM) Low-Inclination Observatory (LIO) collaboration
- CNSA (China)
 - Bilateral meeting with Chinese Space Agency (CNSA) concerning data exchange agreement for Chang'e and Lunar Reconnaissance Orbiter (LRO)



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Findings

Relative to recommendations from the February NAC meeting:

- 1. NAC Science Committee is grateful for the current resolution of the Pu-238 production issue with DOE.**
- 2. NAC Science Committee is encouraged by the excellent planning for revival of NASA's Technology programs, including plans for a technology flight test program.**



Findings (Cont'd)

Relative to flight missions:

3. NAC Science Committee concurs with the recommendation from Astrophysics Subcommittee on revising the Kepler data policy and supports its implementation.